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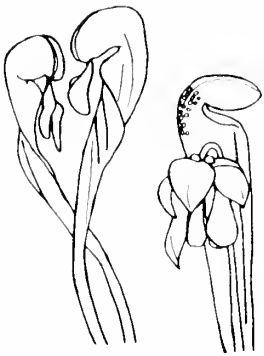
CARNIVOROUS PLANT NEWSLETTER

VOLUME 14, Number 3 SEPTEMBER 1985



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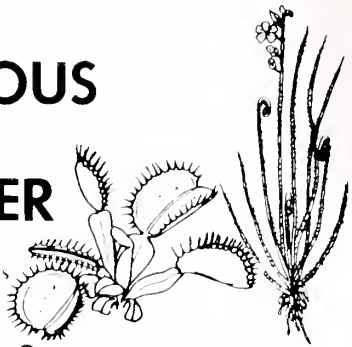

Official Journal of the International Carnivorous Plant Society

Volume 14, Number 3
September 1985

COVER: *S purpurea* 'tundra' adaptation, growing in exposed area in center of Figure 1, page 69. Note that, in late July, only a single pitcher has been produced. Two pitchers from the prior season are also visible. Photo by David Butler.

The co-editors of CPN would like everyone to pay particular attention to the following policies regarding your dues to the ICPS.

All correspondence regarding dues, address changes and missing issues should be sent to Joanne Klingensmith, 437 Las Riendas, Fullerton, CA 92635. DO NOT SEND TO THE CO-EDITORS. Checks for subscriptions and reprints should be made payable to CSUF FOUNDATION-ICPS.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the co-editors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

Copy deadline for the March issue is January 1, 1986.

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NEWS AND VIEWS

PETER D'AMATO (P.O. Box 1372, Guerneville, CA 95446) writes: I enjoyed reading David Butler's piece on the *Drosera rotundifolia* × *intermedia* plants found at Lake Oswego in the New Jersey Pine Barrens. (XIV:1) I was particularly amused at his humor about "wilderness camping" in New Gretna, as I am originally from nearby Tuckerton.

It was during high school that I first discovered *S. purpurea, D. rotundifolia* and *D. intermedia* growing along Tuckerton Lake right in the middle of town. It was there that *D. intermedia* was occasionally found growing on the mossy bark of tree branches hanging low over the boggy edge of that lake. There, and in Manahawkin 10 miles north, a friend and myself found two *D. rotundifolia* plants measuring 5" across, which astounded us as available literature always described the plants as half that size.

I often wandered the bogs of the area looking for unusual growth patterns. Some of my observations were as follows: Thick colonies of 2" high "dwarf" *D. intermedia* were found in pure sand along stream beds in Mystic Island, near Tuckerton. These plants rarely developed the long stalks of *intermedia* found growing in water-covered black peat muck along cedar lakes further inland. Around Batso Lake in the middle of the barrens both *intermedia* and *filiformis* seemed to prefer moss-free muck, while *rotundifolia* and *S. purpurea* grew dense in drier sphagnum.

It was at Lake Oswego where I, too, found a single young 2" high specimen of *D. intermedia* × *filiformis,* deep red in color, the leaf blade as long as the petiole, and curved inward toward the center of the plant. Had I known these hybrids to be infertile, I would have collected it, but did not. For future reference, can they be easily multiplied by leaf cutting? (I presume they can, but did not think of it at the time.) It was also at Lake Oswego that patches of *intermedia* grew along beach sand frequented by bathers, who unknowingly trampled them underfoot, or lay beach towels over them, much to my dismay. (I recall one humorous incident when a rather large lady, crushing and uprooting *intermedia* beneath her as she lay sunning, found the little red plants clinging in a sticky mass on her elbows; she grew quite upset upon my telling her wickedly that they were carnivorous, and she moved to another part of the beach.)

A question: why are my *Sarracenia purpurea,* otherwise extraordinarily healthy, having the following flowering problems? The last two years the bud appears with the spring leaves, only to stop growing upon pushing above the crown. Last year, one of my three plants successfully flowered later on a short 4" stalk in September! I will wait to see if that happens again. Any suggestions?

A request: I've noticed that others as well as myself are sometimes self-conscious of our pronunciations of the Latin names of CP. Perhaps a more knowledgeable person can offer a list in the CP Newsletter of their correct phonetic pronunciations?

P.S. Contrary to published literature, my *Sarracenia flava* produce very much curved winter phyllodia. One would think them to be *S. oreophila,* if we went by general observations reported in print.

PAT HANSEN, (3321 Hamell Road, Fullerton, CA 92635) writes: While moving to another state is exciting, it is hard to turn over my duties with CPN to someone else. The tedium of certain of the tasks has been overshadowed by the tremendous pleasure I have had in working with members of the ICPS. Almost without exception, I have found you to be understanding, charming and full of good humor. Getting to know you, if only by mail, has been a delight. Thank you.

JOHN L. RANDALL (Rt. 3, Box 402, Blacksburg, VA 24060) writes: In response to John Hummer's article in the Decem-

ber 1984 "News and Views" I hold a different view of carnivorous plant (any plant) preservation. Creating "plant banks," as Mr. Hummer suggests, is no doubt an important aspect of any modern concept of species preservation. Germplasm resource centers are a major concern of geneticists, agriculturists, botanists, ecologists, and environmentalists around the globe. There is no substitution, however, for habitat preservation. Rather than devote immense amounts of time, effort, and money into a carnivorous plant "bank," would it not be more reasonable to channel those energies in the direction of habitat conservation? Why not go to the source of the problem rather than deal with the result? Mr. Hummer's "vision" of a large scale "plant bank" where all collections would be "donated" including a "facility with refrigeration units" for rhizome storage which is "supported mainly by the sale of plants" is just not reasonable (putting it mildly). Offering the very plants you are protecting for sale to support conservation only invites the indiscriminate "rescue" of wild populations. In addition, the existence of such a plant bank would only undermine those attempts at habitat preservation. The very heart of the conservation argument is that specific environments cannot be replaced.

My statements are not original. It is a basic tenet that the habitats containing unique organisms should be the focus in conservation efforts. Displacing species into "zoos" should be considered only in last ditch efforts of conservation.

RUSSELL A. REDLER (304 Jefferson Heights Avenue, Jefferson, LA 70121).

I enjoy the ICPS bulletin, particularly those articles that stress culture tips and growing mixes. Some years ago I tried *Nepenthes khasiana* from seed (Parks Seed Co., Greenwood, S. Carolina). Sown on live sphagnum moss and misted with very mild Atlas brand liquid fish emulsion, they grew and formed pitchers. Experimenting with Miracle-Gro (15-30-15) and 20-20-20 misted dilutions caused the plants to rapidly decline, although other growers may have had success with these fertilizers. The past two winters were so severe here in New Orleans, that I lost the *Nepenthes* in my orchid greenhouse, as they were not nearest the heater. Also lost the epiphytic *Vireyas* (Malasian rhododendrons) which are so lovely and growing in popularity.

ADRIAN SLACK (Barton St. David, Somerton, Somerset, England).

A recent article published in an American weekly newspaper quoted me as saying, "People don't know that the beautiful *Nepenthes rajah* is deadly. The giant plant actually eats small monkeys in its native environment of Borneo, and is capable of ingesting infants as well. They are status symbols because they are a novelty, but people don't realize how dangerous many of them really are. When you remove the specimens from their natural habitat, you can't change the plant's 'instincts'. Anything that moves is fair game."

This article was widely published not only in Australia but in the USA and goes on to report that Adrian Slack considers *Nepenthes rajah* and some other CP to pose definite dangers to the lives of domestic animals and babies! I believe these stories may be the result of something that I said in jest which could never be taken seriously by even the most gullible person. If so, I offer my apologies and hope that such sensationalism will do little to diminish the growing interest in CP so evident today.

CURTIS YAX (12 Division, Apt. 1, Oneonta, NY 13820).

In the July-August issue of *Science 85*, p 66-67 written by Gary Blonston is an excellent picture of one, huge *Heliamphora* pitcher. It has a *Nepenthes*-like hood, and at first glance I thought it was a *Nepenthes*. The area that was explored was Cerro de la Neblina which borders on northern Brazil in southern Venezuela. There is a map, a nice picture of the mountains taken from an airplane, a farout photo of the Venezuelan valley which looks pre-

(Continued on page 81)

SEED BANK

Patrick Dwyer (St. Michael's Episcopal Church,
49 Killean Park, Albany, NY 12205)

To send seed: Please remove seed from the seed capsules and place it in small envelopes (preferably paper so that they dry out enough to prevent mold). Label with the origin and date of collection, including habitat if it is exotic. Fold the envelope once or twice before taping so that the seeds don't stick to the tape. After the seed is received it will be placed in smaller packets; donors will be informed of how many packets they have donated. A donation of 10-19 packets earns one free seed packet of comparable rarity, with one additional free packet for each additional 10 packets.

Do not ask to trade for seed from the bank. Everyone will have to buy all but the free packets.

To order seed: Please enclose payment. List the seeds desired and an equal number of substitutes in order of preference. If requested, Patrick will add any cultural instructions of which he is aware. Each issue of CPN will include an update of the inventory. Cost per packet: $.75. (Number of packets is listed if less than 15 are available.)

Darlingtonia californica (14); *Drosera aliciae, D. anglica* (5), *D. auriculata, D. binata, D. brevifolia* (2), *D. burkeana* (6), *D. burmannii, D. burmannii* (green) (2), *D. capensis, D. capensis* (narrow), *D. capensis* (mix of reg. and narrow), *D. capillaris, D. cuneifolia* (2), *D. dielsiana, D. filiformis filiformis* (5), *D. glanduligera* (11), *D. indica, D. indica* (Australia), *D. intermedia, D. macrantha* (pink fl.), *D. montana* (3), *D. montana* (white fl.) (3), *D. natalensis* (10), *D. nitidula* (1), *D. peltata, D. pulchella* (6), *D. pygmaea, D. rotundifolia, D. rotundifolia* (forked stalks) (5), *D. spathulata, D. spath.* (Kansai), *D. spath.* (Kansai-white fl.) (3), *D. spath.* (Kanto), *D. spath.* (rotundate) (1), *D. spath.* (Tanega) (5), *D. spath.* (white fl.) (2), *D. stolonifera, D. trinervia* (10); *Drosophyllum lusitanicum* (10); *Nepenthes albomarginata, N.* sp. (Sumatra) (15); *Pinguicula alpina* (10), *P. caerulea* (1), *P. grandiflora rosei* (10), *P. moranensis* (4), *P. pumila* (5), *P. vulgaris* (6), *P. vulgaris* bicolor (10); *Polypompholyx multifida* (10); *Sarracenia alata, S. flava, S. flava* (green) (5), *S. flava* (Green Swamp) (6), *S. flava* (red tube-green lid), *S. flava* (color FM mix), *S. flava rugelii* (6), *S. leucophylla, S. leucophylla* (large stocky) (5), *S. leucophylla* (tall thin red) (8), *S. minor* (4), *S. purpurea purpurea, S. purpurea venosa* (10), *S. purpurea venosa chipoca* (3), *S. rubra* (5), *S. rubra gulfensis* (2), *S. rubra jonesii* (8), *Sarracenia* hybrid mix, *S. alata* × *leuco* (10), *S. alata* (red) × *leuco* (4), *S. alata*/minor (7), *S. alata/purp. purp.* (4), *S. flava* × *leuco. S. flava* × *purp. S. leuco* × *rubra* (1), *S. oreo* × *alata, S. psitt/rubra gulfensis* (1), *S. purp. purp.* × *leuco.* (3), *S. purp. venosa* × *leuco* (14), *S. rubra* × *oreo* (2), *S. rubra gulfensis/leuco* (4), *S. oreo/rubra jonesii hetero.* (1), *S. leuco/purp* × *leuco* (1), *S. psitt* × *purp.* × *leuco* (7), *S. (purp.* × *flava)* × *alata* (12), *S. alata*/minor × *psitt/oreo* (1), *S. leuco*/minor × *psitt/oreo* (9), *S. oreo/psitt* × *leuco*/minor (2), *S. (purp* × *flava)* × *(purp/flava)* (4), *Utricularia capensis* (10), *U. deliculata* (2), *U. hookeri* (8), *U. juncea* (6), *U. lateriflora, U. racemosa* (5), *U. reticulata* (2), *U. subulata* (5), *U. violacea* (9).

Seed Bank Notice. In order to ease Patrick Dwyer's bookkeeping load, he will now keep records of packets owed to people (especially to donors) only for the full preceding year.

CEPHALOTUS FOLLICULARIS
THE WESTERN AUSTRALIA PITCHER PLANT

by Robert Riedl

Cephalotus follicularis is the sole member of its own plant family, the Cephalotaceae. No varieties of forms are officially recognized, yet several growers have noted significant differences of growth habit in different clones of the plant, an observation which might be further substantiated as more plant material becomes available.

Cephalotus follicularis from the Greek word 'Kephalotos' meaning 'headed' which refers to the filaments of the stamens, and the Latin word 'folliculus' meaning 'small pouch', which describes the shape of the pitcher is a plant of strange and singular appearance even amongst pitcher plants. It is a relatively small, rosetted plant with a thick, branching root system which bears numerous clusters of pitchers during most of the year. During the cool season, particularly during late winter and spring, more conventional foliage leaves are produced, oblong in shape, glossy green and fleshy. The typical pitchers appear at the onset of the warmer months and are continuously formed until late autumn. The pitchers may be green when grown in shade, but colour deep crimson in a sunny position and may reach up to 6 cm in length. Their shape has been compared to the one of a moccasin, ornated with three ribs stretching from the toe to the top, with its heel turned up and over to form an awning or lid over the pitcher mouth which has a well developed rim of smooth, glossy ribbings which curve over into the pitcher opening where they end abruptly in downward pointing teeth. Inside the pitcher, just below the teeth, is a downward pointing, light green, smooth collar or ledge overhanging the cavity of the pitcher. Insect-attracting nectar glands are scattered over the entire surface of this ledge, but are also found, like an initial lure to insects, a preliminary invitation device, on the internal and external surfaces of the lid itself, which has numerous, unpigmented, translucent 'windows' or areolae similar in appearance to those found in *Sarracenia minor* and *Darlingtonia*.

Insects feeding along the collar surface have frequently been observed to lose coordination of their movements as if under the influence of some narcotic fed to them with the nectar. Once they have lost their footing, they fall into the purplish-black coloured cavity of the pitcher which contains a small amount of fluid, which seems to have a clogging, paralysing effect on the victims. The cavity or well of the pitcher is equipped with numerous digestive glands in its upper part which reach their greatest concentration in two distinct, thickened, elongated areas about halfway down on each side of the cavity.

It is still unclear whether digestion of prey is entirely affected by the digestive enzyme system secreted by the plant or whether part of the digestion process is to be contributed to bacteria present in the pitcher fluid. While I was able to demonstrate the presence of bacteria in the pitcher fluid and an increase in their population density subject to the age of the pitcher and the relative concentration of accumulated prey, I was unable to demonstrate any significant contribution by bacteria in the digestion process.

In an experiment the same number of ants was introduced to mature pitchers of about the same age; the fluid in half the pitchers was then sterilized using the antibiotics Streptomycin and Penicillin, and the lids of all test pitchers were artificially sealed over the pitcher openings to prevent further introduction of the prey. Periodically the degree of prey solubilisation was visually examined by lifting the lids from the pitcher openings to inspect the cavity contents with the aid of a dentist's mirror. The observed result was that the rate of prey break-down appeared to be about the same in all pitchers. This would suggest that bacteria found in pitcher fluid may be

Cephalotus growing through base of pot.

Photo by Phill Mann.

present primarily in the role of opportunists feeding on nutrients made available by enzymes of the plant acting on the bodies of prey. Ultimately, it would seem that this 'pirating' of nutrients from the plant by bacteria is only temporary as the food assimilated by bacteria becomes to a large extent available again to the plant upon the death and ensuing lysis of the bacteria cells. Irrespective of the effect or absence of any effect by bacteria upon prey digestion in *Cephalotus*, it was interesting to note that the rate of digestion seemed more rapid in the temperature range between 25 and 35 deg. C, slowing down if the temperature was further increased and virtually coming to a standstill at temperatures below 15 deg. C. This may suggest a direct confirmation of the behavior of most biochemical processes, reaching an optimal reaction rate over a more or less narrowly defined temperature range and slowing down again if the reaction takes place below or above the optimum temperature limits due to inactivation or denaturation respectively of the chemical compound eliciting a particular reaction sequence. The fact that efficient digestion of prey and subsequent nutrient assimilation is very slow or non-existent in *Cephalotus* at low temperatures could give a clue to why this plant produces different kinds of leaves at different times of the year; it seems more opportune and of greater survival value for the plant to invest and expend its energies during winter and spring in more conventional foliage leaves which are better equipped than pitchers to photosynthesize and therefore more suited for the manufacture of sugars and starches, and it only produces summer leaves or pitchers when the enzyme system associated with them can be utilized to the full in the translation and assimilation of insect-derived nitrogen, potassium, phosphorus, saccharides and trace elements.

Cephalotus follicularis is easily cultivated in a variety of media: pure sphagnum; quartz-sand and peat in about equal parts with a little perlite added for better soil aeration; and some growers claim excellent results by using a mix of 2 parts peat, 2 parts sieved, well rotted leaf mould, one part perlite and one part quartz-sand. Irrespective of the particular potting medium used, it is of utmost importance that the plants are not kept too wet, especially not during the cooler months of the year. While I stand my *Cephalotus* containers into a 5cm deep tray with water during the summer months, I keep the plants just slightly damp during the cool season, watering them only about once a week from above, but avoiding wetting the foliage or crown to prevent rotting. Most failures with this species seem to be the direct result of keeping the compost too wet, having insufficient soil aeration or using an unsuitable potting mixture. These plants eventually form long underground root systems which branch over long distances. Secondary plants arise at some distance from the parent plant. Bearing this in mind it is better to grow *Cephalotus* in plastic trays of a depth not less than 15cm, provided with additional drainage and aeration holes (I use polyurethane fruit boxes available from most greengrocers). Although the Albany Pitcher Plant grows in nature in a Mediterranean climate of relatively dry summers and wet winters, I have no problem growing these plants in Sydney all the year around unprotected in the open, in spite of the fact that the climate here is more subtropical with relatively dry, long spells of high humidity. At first I used to grow *Cephalotus* in broken light which yielded luxurious growth of long lasting winter leaves, but produced few, although slightly larger, plain-green pitchers. Since I have moved my plants to a position where they receive almost full sun for most of the day, they have started to grow pitchers much earlier in the season, in greater quantity and of much more vivid colouration.

Cephalotus blooms from mid to late summer. The flowers are borne on a slender 50cm long stem. The actual flowers are inconspicuous, lack petals, are whitish-green and rather small. I am not certain whether the flowers can be self-pollinated as I have never had more than one plant in flower in any given year and

all my attempts to produce seeds under these circumstances have so far failed.

Vegetative propagation is easily accomplished by taking 3-5cm long cuttings of the thick, fleshy root from a large plant in late spring. The cut pieces are allowed to air-dry for a few hours, are dusted with a fungicide (Benlate, Captan, Difolatan, etc.) and rooting hormone (available from most nurseries) and are placed horizontally and not deeper than about 1 cm into a pot filled with a sand/peat mix. The potting mix is then lightly watered and the pot covered with a piece of window glass to minimize evaporation and placed into light shade. Water should be applied only sparingly during this period, but in sufficient quantity to maintain the soil mix slightly damp. About 3-4 weeks later young plantlets can now be gradually hardened off. About a year later the young plants can be subdivided and treated like adult plants.

Another method of vegetive propagation is to take leaf cuttings. An entire leaf or pitcher with the stalk intact is removed, washed in diluted fungicide and the cut base of the stalk is dipped into rooting hormone. The stalk or petiole is then lightly pushed into a bed of live sphagnum with the leaf blade or pitcher sitting flat on its surface. The propagation container is covered with glass or clear plastic to prevent excessive evaporation of moisture and placed into light shade. The tiny corm, which may eventually form near the cut end of the leaf, will with time differentiate into leaves and tiny roots. The plantlet can then be gradually accustomed to stronger light. Repeated spraying with fungicide during the differentiation process seems necessary to prevent damping off.

It must be borne in mind that propagation by root or leaf cuttings only increases the number of plants of the same clone, which makes them all genetically identical. Only plants grown from cross-pollinated seed, and let us assume that cross-pollination is necessary to produce viable seed in *Cephalotus,* will give rise to new clones, to new genetic combinations. To successfully grow *Cephalotus* from seed should be a challenge for all CP enthusiasts.

Cephalotus follicularis (like most CP's) is remarkably free from disease and pests. Fungal and bacterial decay of the crown and root system only occurs if plant and potting mix are kept too wet and under-aerated. Caterpillars occasionally become a nuisance, but they can be easily picked off by hand or killed using a pyrethrum spray.

Reprinted from "Flytrap News," official newspaper of the Carnivorous Plant Society of New South Wales, July/Aug., No. 1, 1985.

REMINDER

While the editors are very interested in looking at color prints of your plants, this medium is not suitable for reproduction in CPN. Results are noticeably better with color transparencies (slides); therefore, the editors prefer them over prints.

In taking pictures of your plants, keep in mind that CPN can use vertical shots very nicely as quarter or whole page photos (see p. 71). Horizontal shots are used as half-page photos.

Black and white photos are very welcome as long as they have good contrast and focus.

NOTICE

ICPS Business Manager Pat Hansen has resigned from her duties with the society because of an upcoming transfer and move to Arizona. The new business manager will be Joanne Klingensmith. All routine correspondence should be addressed to her c/o The Fullerton Arboretum, Fullerton, CA 92634. Items of a more urgent nature should be sent to her home: 437 Las Riendas, Fullerton, CA 92635.

A SIMPLE TECHNIQUE FOR THE PRESERVATION OF CP

by Gregory T. Shanos, 160 Budlong Ave., Warwick, RI

A familiar technique for the preservation of flowers can successfully be applied to carnivorous plants. This method utilizes the dessicant, (drying agent) silica gel. The specimen is simply covered with silica gel in a sealed container for 24 to 48 hours at room temperature. After the elapsed time period, the plant is removed, and any excess silica that may adhere to the specimen can be gently swept off with an artist's brush. The dessicant can be reused or "reactivated" by heating in an oven at 350 degrees Fahrenheit for one hour.

Silica gel can be purchased from any nursery or chemical supply company. This compound causes the dehydration of living tissue without distortion of the specimens' shape or form. There is also little variation in color. In fact, colors tend to darken upon dehydration. The dehydrated specimens are quite fragile having the consistency of tissue paper. Durability of the specimen is increased by using an acrylic matte sealer. Spraying is strongly recommended since dehydrated specimens are moisture sensitive.

Carnivorous plants that preserve best are pitcher plants, especially *Cephalotus, Darlingtonia, Nepenthes,* and *Sarracenia. Drosera* and *Pinguicula* can be preserved with varying amounts of success. *Dionaea* also preserves well with excellent retention of color.

I urge all carnivorous plant enthusiasts to experiment with this technique and comment on their results in future volumes of the *Carnivorous Plant Newsletter.*

How to Get Rid of That Algae in Your Utricularia Tank

by Robert Manzoni

Owners of aquatic *Utricularia* know what a problem algae is. In fact, the green, filamentous algae (or Blanket Weed as it is more commonly known) may grow even if you place it in a sunless position. I have *Utricularia australis* in a small tank in the southern part of the house receiving filtered sunless light. The algae made the water look murky and obscured the *Utricularia.* I decided to find a way to combat this problem so I consulted our society's library (one of the privileges of being a society librarian).

The best solution appeared to be making a chemical mixture of 0.2 grams of copper sulphate crystal in 540 ml of distilled water. However, I did not like the idea of adding various chemicals to the water so I kept researching. It was not until I talked to a few nurserymen that one of them suggested I use a water snail to combat the algae. He in fact owned an aquarium and the water snails kept it clean from algae. I decided to try it so I went to my nearest creek and got a water snail. I then put it in the tank and promptly forgot about it for a week.

A week later I walked past it and noticed that the tank was clear of algae! The water snail had eaten all the algae and the water was finally clear. The past few weeks I have been keeping a careful eye on it to see that it was not also eating the *Utricularia,* but to my knowledge, it hasn't.

If anybody else is thinking of using water snails, then maybe a handful would be sufficient for larger size containers.

Reprinted from the journal of the Victorian Carnivorous Plant Society, Vol. 2, No. 2, 1985.

Figure 1. Living *Dionaea muscipula* specimen.

Figure 2. Silica gel dehydrated specimen

Figure 3. Dehydrated and acrylic matte sealed specimen

ECOLOGICAL ADAPTIONS OF *SARRACENIA PURPUREA* IN COASTAL MAINE SPHAGNUM MOSS

(David E. Butler, 5114 Elm Street, Bethesda, MD 20814)

For a number of years, I have spent summer vacations in coastal Maine. The better-known attractions of "Vacationland" fill many books and are beyond the scope of this note. An added attraction for the CP enthusiast is the several species of sundews and the northern pitcher plant, *Sarracenia purpurea*, which inhabit local glacial bogs and heaths.

Many of these habitats contain extensive populations of *S. purpurea* and *Drosera rotundifolia*. *D. intermedia* may also be found in coastal Maine, but it is not common. The rarer sundews, such as *D. anglica* and *linearis*, have been reported in the northern part of the state (Schnell 1976; Newman 1980), but do not occur in the coastal region. However, temperature differences are unlikely to account for the absence of these species from the coastal area. For example, the average January temperature for Portland, Maine, in the coastal zone, is 31.2/11.7 degrees Fahrenheit. Marquette, Michigan, near known sites of *D. linearis*, averages 24.8/12.0 for the same month. On the other hand, Caribou, Maine, near the reported sites of *D. linearis* in Maine, is much colder. January temperatures average a mere 19.8/1.5 (Ruffner & Blair 1978). Thus, a diligent search may yield a range extension of these rarer sundews to the coastal area.

Although the coastal climate is relatively temperate, wind effects in unprotected areas can be quite severe. Indeed, some of the most interesting adaptions of the northern pitcher plant involve sites that are exposed to severe winds. My observations of *S. purpurea* in Maine include habitats on two coastal islands, Vinalhaven and Mount Desert. The climate of the two islands is identical: north temperate, characterized by mossy forest, bogs and open heath. Soil is gravelly and thin. In moist depressions, the soil is often pure peat, overlaid by sphagnum. Both islands are often shrouded in thick fog. On these islands, *S. purpurea* has adapted to a wide range of micro-habitats. Most remarkable is the range of adaptation in terms of pitcher size, coloration and form, even within the same bog area. Despite wide variations in growth habit, it is unlikely that these adaptations represent botanically distinguishable forms or subspecies.

Figure 1 illustrates a general habitat located within the boundaries of Acadia National Park on Mount Desert Island. The area, known only as "the Heath," supports a large colony of *S. purpurea*. The Heath lies in a remote area no more than several hundred yards from the ocean. Although seemingly solid ground, the area is in fact a eutrophicated glacial lake, covered by a continuous mat of sphagnum. The entire center of the area, several hundred yards in diameter, is quite exposed to the elements. Being an open field, the area receives full sun from sunrise to sunset.

Around the edges of the exposed area, low shrubs and pines are encroaching on the lake bed. The shrubs provide some shelter from the wind, and many typical forms of *S. purpurea* may be found in these areas. Plants in this slightly sheltered area flower freely. However, in the open areas, specimens of *S. purpurea* take on a depauperate, stunted form with pitchers rarely more than six inches in length. Based upon observation of new and aged pitchers, it appears that rarely are more than two or three pitchers produced in a

single season. However, these pitchers have unusually intense coloration. Many of these pitchers are entirely red and gold even in mid-summer (Cover).

Surprisingly, many of these pitchers take on the superficial form of the southern *S. purpurea*. Pitchers tend to be comparatively short and wide, and sometimes have scalloped edges. This is clearly not the southern form, however, as the outer surface of the pitcher is glabrous and the hood margins do not extend well beyond the pitcher lip. One hypothesis for development of these pitchers is a reaction to high winds that undoubtedly sweep through this habitat. Low, squat pitchers are resistant to tipping over in a heavy wind. Similarly, the scalloped hood margins may well be more resistant to tearing in high winds, much as corrugated cardboard is stronger than flat.

Although the depauperate adaption of *S. purpurea* is common in this bog, none of the plants observed had flowered. It appears that this is due to a combination of factors in the marginal habitat. The exposed position of the plants will result in wind damage to any flowering stalks before they reach any significant height. A second consequence of this habitat is a tendency to dessicate in the summer sun or in high wind conditions. Thus, conditions in the open heath are not conducive to flowering, even though plants in the same area with even a modicum of brush to shelter them from the wind will flower freely. It is logical to conclude that seeds of this form are simply dispersed from the 'average' plants growing nearby. This adaption may informally be viewed as a "tundra" ecophene.

Towards the edge of the heath, the terrain becomes heavily wooded. The soil remains deep sphagnum, however. Many *S. purpurea* may be found in this heavily shaded environment. In general, pitchers growing in these low light conditions take on the elongated form illustrated by Pietropalo (1976), and also discussed by Mandossian (1966). Mandossian found that, at an average reading of 755 footcandles, *S. purpurea* will develop flat leaves with a very narrow pitcher, if any, and a wide wing. **(Continued on page 72)**

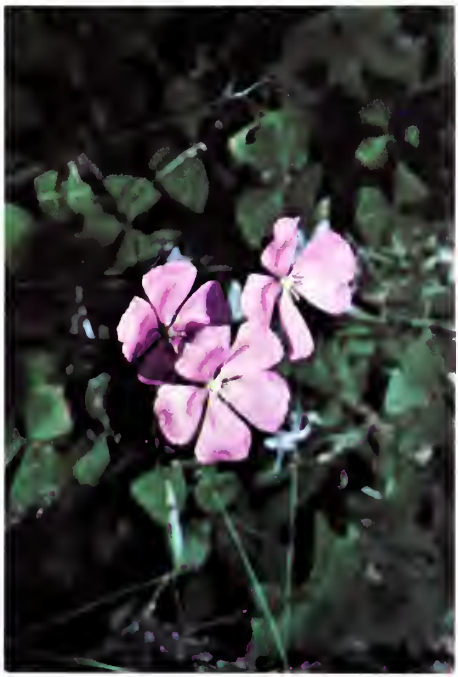
Fig. 1: The Heath, Mount Desert Island, Maine, looking toward the Western Mountains. Photo by David Butler.

Figure 3: *S. purpurea* in heavily shaded habitat, showing elongated pitcher development and maroon styles.

Photos by David Butler

Figure 5: Unusually large stoloniferous clone.

Fig. 4: *S. purpurea* in typical habitat, form with scalloped hood margins.
David Butler



Drosera hamiltonii
Photo by J. Mazrimas
See page 75.

Fig. 6: Highly colored 'ripicola' emulation. Photo by David Butler.

A vigorous example of the shade growing form is illustrated in Figure 3. Although heavily shaded by its neighbor, the plant did receive some dappled sun in mid-afternoon. The leaves, while elongated, maintain an upright position due to the tall grass growing along with the pitchers. Many of these shade growers had flowered, resulting in expanded seed capsules.

Although the pitchers were almost entirely green as one would expect, the flower sepals were a surprisingly dark maroon color. I was not able to observe these plants in flower, but speculate that the petals may even be darker than the maroon petals of the typical ecophene.

Assuming that the two ecophenes discussed *supra* do not represent the "typical" habitat, other areas of the heath certainly do. The tree-lined perimeter of the eutrophicated lake is broken in several areas by open stream beds which have themselves become boggy with sphagnum growth. In these areas, *S. purpurea* is plentiful. Plants are of the typical northern form with varying amounts of red venation superimposed on mostly green pitchers. An interesting variation occurs when the pitcher hood develops scalloped edges, again reminiscent of the southern forms of *S. purpurea* (Figure 4). Plants in this area are not exposed to high winds. When occurring in a wind-sheltered habitat, this variation is likely due less to ecological adaptation, than an expression of the variability of the species.

Many plants in these optimum habitat areas are vigorous, multi-crowned specimens. An occasional plant will grow to an extremely large size. Figure 5 is an illustration of the largest plant noted in the heath area, which has spread over an area approximately .5 x 1.5 meters, and developed in the summer of 1984 eighteen flower stalks. The specimen is reminiscent of the 'stolonifera' variant described by Macfarland *et al.* (1933). Macfarlane reported clones ranging from three to twelve feet in width. I have not yet seen a specimen in the larger portion of this range. However, much of the heath remains to be explored.

Field observation suggests two arguments against varietal status for the stoloniferous plants. First, stoloniferous specimens are isolated among more normal-sized clones. Second, pitchers of stoloniferous specimens are often indistinguishable, in terms of form and coloration, from their neighbors.

Nomenclatural arguments aside, however, a large *S. purpurea* in the field is a magnificent sight to the CP enthusiast. I have also observed large clonal specimens of *S. purpurea* on Vinalhaven Island, about fifty miles as the puffin flies from the heath. None were as large as the illustration, and many appear to be in declining habitats—a pond, for example, that has eutrophicated to the point that the water table is not high enough to support the species.

Figure 6 is an example of a plant from such a habitat. Unlike the heath, this glacial pond has become an open peat bog. During dry spells the surface may dry to a hard crust. Indeed, many of the largest plants in this particular bog died during the dry summers of 1978 and 1979.

The illustrated survivor emulates the 'ripicola' variant described by Boivin (1951), but currently the subject of some dispute as a recognizable variant (e.g. Schnell 1979). The pitchers are shiny, brittle, numerous and highly colored, although perhaps not to the extreme extent of the classic 'ripicola' form. In contrast to the 'tundra' adaptation described earlier, the habitat of Figure 6 is protected from high winds by surrounding trees and rock bluffs. At least in the observed habitat, the subspecific designation would not appear to be appropriate, for plants growing in sphagnum towards the edge of the pond exhibited more "average" characteristics.

The foregoing discussion does not, of course, exhaust the possible habitats of this species in the coastal zone. One other noteworthy habitat was observed on Vinalhaven, where I located several colonies along the margin of a brackish pond formed by damming a salt water inlet.

The water remains sufficiently saline to support large colonies of jellyfish in the warm summer months. Yet pitcher plants flourish in sphagnum mats at lakeside. The roots invariably extend into the alkaline substrate. Unlike the typical fresh water pond, sphagnum cannot survive at or below the water level, additional evidence of the alkalinity of the habitat. Other than the apparent pH differential of the growing medium, however, plants exhibit no noteworthy features.

This completes the survey of ecological adaptions of *S. purpurea* in coastal Maine. I conclude that, in coastal Maine, *S. purpurea* exhibits extensive variation in pitcher size, form, and coloration. The number of pitchers and crowns per plant also varies considerably. In addition, some variation in flower color is suspected. Such variation raises the question of appropriate botanical classification.

Available evidence indicates that the observed differences are primarily habitat-based. However, one should not hastily rule out the possibility of formal or varietal distinction if appropriate empirical research is conducted. In particular, such research may resolve the question whether the scalloped vs. smooth hood margin is a genetic trait, and perhaps an indicator of other, less obvious distinctions within the northern subspecies. In addition, such variation well within the range of the northern subspecies casts some doubt on the validity of reports of intergrades or habitation by both the northern and southern subspecies in the same bog where ranges merge.

The prior work of Mandossian is worth noting when considering the question of ecological adaptation vs. formal status as an explanation for the variations noted above. Mandossian (1966) studied the impact of reciprocal transplants on *S. purpurea*. In that experiment, specimens were transplanted from acid-sphagnum bogs to alkaline-marl bogs and vice versa. Plants were assigned a leaf area index based upon the formula two-thirds length x width ("LW value"). In terms of both LW value and number of leaves per plant, reciprocal transplants approached their new neighbors after two growing seasons. Mandossian concluded that differences in pitcher size and number were primarily habitat-based. All but one of the habitats discussed in this note are likely to be acid, as they are peat or sphagnum based. Thus, although it is not practical to conduct reciprocal transplants in the areas I observed, Mandossian's conclusions are consistent with the conclusions of this note.

It is apparent that *S. purpurea* is well adapted to the harsh north temperate climate. While the species is not easy for the casual observer to locate, it is not rare if the appropriate habitat is available. CP enthusiasts should be grateful to the creators of Acadia National Park for permitting this species to flourish in its unique and scenic natural habitat.

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THE ALBANY AREA

By Phill Mann, 6 Houston Cres., Bunbury, West Australia

The trip was a rushed one for my girlfriend and myself, one of 1200 kilometres to collect a few plants and specimens, and check any flowering before the season ended here. The destination was the Albany area of the south coast of the state, one of the richest areas for wildflowers and especially carnivorous plants.

We departed Friday afternoon and made the first stop on the Muir Highway between Manjimup and Mt. Barker. Here on the side of the road in the wet flats *Polypompholyx multifida, P. tennella* and *Utricularia hookerii* were scattered among the reeds. These plants were small in size and had nearly finished flowering.

With time getting late we made one more stop for the day along Milbrook Road, just north of Albany where *Drosera* sp. "Milbrook Rd" grows. Here we found *Drosera platystigma* growing in the thousands in a road side gully 20 metres long by 4 metres wide. The soil was an iron, stone and clay which is known as "gravel" here.

In white silica sand type soil in another location *Drosera dichrosepala* or as near as can be identified grew in among a thick area of grasses which in time would choke the *Drosera* out. About 10 years ago *Drosera platypoda* grew in this location but with the encroachment of nearby pasture grasses it has now gone.

The next day, Saturday, we started on the property where we had camped and where a small river ran through an area of natural bush. We found a multitude of *Drosera* and many climbers of types which had finished and dried off. On the sides of the track leading down to the river *Drosera dichrosepala* grew in profusion with many plants still in flower. Although conditions were very dry in this location the pygmy *Drosera* were very healthy and covered in sticky secretion, the leaves were dark red on the plants receiving full sun. Among these were scattered the large form of *Drosera scorpoides* as described in "Flower Aust. Vol. 8". This pygmy *Drosera* is very striking in that its growth is very stout and colourful, (see photo page 71 of "Carnivorous Plants of the World," by K. & M. KONDO). A few of these plants were still flowering with the small white flowers borne on short hairy scapes.

Further up the slope where the soil became very poor in composition a few small scattered plants of *Drosera paleacea* var. *tricaulis* were growing but these plants were not as healthy as the others with very few leaves still in a sticky condition.

At the bottom of the slope I had previously found plenty of *Cephalotus follicularis* plants growing in the wet thickets, but as there had not been a fire through this area for about 10 years the swampy ground was covered in reeds, grass and native *Melaleuca* bushes so thick that I could only manage to push and fight my way about four to five metres from the track. The bushes were at least 1½ metres overhead and I could not see my feet. I decided to forgo this area for this trip as these areas are favourite breeding grounds for snakes.

Leaving this area we travelled about 15 kms and stopped to have a look in a roadside culvert as in these areas winter rains are collected and the pygmy *Drosera* thrive. There were only a few plants of *Drosera dichrosepala* that were nearly dead, and one very large, very black and very angry tiger snake, a dangerous venomous species that will often attack rather than turn away when disturbed. Fortunately I always carry my trusty shotgun for this reason when venturing into these areas, so it being a case of him or me I decided it would be him. After this scene it made us very jumpy every time we ventured from the road.

Turning from this road we travelled along the Hassell Highway and made a stop at a wet flat area of road verge. Here we found a strange coloured flowering form of a plant that has similar growth

characteristics as *Drosera occidentalis* and/or *Drosera pygmaea*. *Drosera pygmaea* only grows in the Eastern States of Australia and *Drosera occidentalis* is considered endangered according to the authorities here and confined to an area 400 kms north of this location. This plant is common along the South Coast and is possibly a new species. There were only a few dozen of these plants, and the couple that were flowering had a very pretty colour of apricot. The whole plant was 10 to 12 mm wide and 5 mm high. The single flower was borne on a scape 2 cm high with petals 6 mm wide. Since the plants are so small it is necessary to get down on your hands and knees when looking for them; this creates some very strange looks from passing motorists.

Travelling west back towards Albany we stopped in a parking bay on the side of the road where *Drosera occidentalis* type plants with white flowers and larger growths were very common, along with *Drosera myriantha* which were in full flower. Here the soil was a very damp sticky clay and it abounded in many healthy plants of *Drosera platypoda*. Most of them were of an orange to red colouration due to the full sun that they received. Close by under a thick area of bushes were a few plants of an unusual form of *Drosera stolonifera*. The stolons travelled along under the litter on the ground after coming to the surface from the bulb. They averaged 10 cm of runner before the plants appeared. The stem then rambled amongst the growth up to 15 cm in sections of four to five leaves. None of the plants had any sign of flowers.

On the iron stone ridges neary *Drosera scorpoides* grew with *Drosera platystigma*. These plants of *Drosera scorpoides* had flowers of bright pink to mauve, a most striking colour.

On the western side of Albany within a railway reserve we found the white flowered *Drosera scorpoides* growing amongst reeds around swampy pools. These plants reached a height of 18 to 20 cm, but growing in the open, a metre away, they only grew to 6 to 8 cm. Their leaves attained the bright red colouration, and flowers were pink.

The silica sand flats that bordered the other sides of the pools were small pygmy *Drosera* that will be a new species or a subspecies of *Drosera dichrosepala* as they varied so much from all descriptions recorded. *Drosera pulchella* were very prolific all around these areas; nearly all were in full flower.

Further along a section of this reserve had been burnt within the last three months and the slopes were barren of nearly all growth except large clumps of *Cephalotus follicularis*. The clumps were every metre or so and had pitchers up to 50 mm in length. The pitchers had not been there long but most were ful of insects, mainly ants. All the clumps had 10 to a dozen flower spikes 10 cm high yet to flower. Having no cover from the full sun they were starting to turn blood red in colour. The ground of this slope they were growing in was similar to a sphagnum bog in that it consisted of about 90% masses and although no water was present on the surface, when trodden on a considerable amount oozed forth. The water present would be seepage from the hills behind this area. A few small plants of *Drosera hamiltonii* had survived the fire and were just starting to send out new leaves. (See page 71 for *D. hamiltonii* flower.)

Time to head off home and with one last stop on the Muir Highway again, where patches of *Drosera gigantea* shone a golden green colour in the afternoon sunlight. The plants were up to one metre high and so thick that I was unable to walk through them without destroying any of the plants. The *Drosera gigantea* grew around small lakes approx. 2 to 3 hectares in size. The depth of the water was only about 60 mm and covered completely with *Polypompholyx multifida* and *Utricularia hookeri* creating a carpet of pink and mauve. I collected some seed and took a few photos. On the water's edge *Polypompholyx tenella*, *Utricularia menziesii* and *Utricularia violacaea* grew in small numbers. By now the sun was about to

set so we decided to call it a day and head straight for home to sort out all the plants and specimens.

All plants collected were done so under license from the Fisheries and Wildlife Department of Western Australia.

Chelsea Flower Show Report

For those not able to attend, the time spent preparing the stand and also manning it was rewarded with the Silver Flora medal. The centrepiece consisted of a circular pond supporting a tree. A large *N. bicalcarata* hung from the top of the tree, whose branches had water dripping from them. The base was surrounded by a variety of different *Nepenthes* species brought over for the show by a member from Brunei. One end of the stand was covered in small *Nepenthes,* whilst *Sarracenia* formed a backdrop at the other.

Those who saw the BBC programme "Growing for Gold" will have had a glimpse of the tree as well as the impressive sight of the large clump of *P. grandiflora.*

We hope to publish a photograph of the stand, providing the films come out, in the winter journal.

How and when do we start. The answer's simple, straight after the previous show.

The main problem is selecting and having sufficient quantity of plants with enough growth for the display.

They have to be selected, potted and establihed before the end of the summer and then around February given extra heat to start them into growth. The sarracenias tend to flower by mid/end March giving them a reasonable number of pitchers in time for May.

There is a myriad of paperwork to be completed for the RHS as well as hundreds of small but equally important tasks to ensure success.

This year's Chelsea programme went like this:

FRIDAY 17th May. Pick up plants plus R. Cantley from airport, go direct to stand and pot up all *Nepenthes.*

Saturday 18th. Transport pond, tree, plants, peat, water (soft) and start laying out. Run out of peat so have to scrounge from another stand. Find not quite enough plants so have to borrow from a well-known source in Somerset (thanks). By late Saturday night stand is starting to look good.

Sunday 19th. Sort out watering system on tree, cover in moss and attach plants. Finish landscaping stand.

Monday 20th. Last minute tidying up, clear up around stand and await judges, press and royalty. This year Princess Alexandra paid us a visit, interview for RHS and TVS. The BBC also paid us a visit and we got a mention on 'Growing for Gold' and BBC2 newsweek.

Tuesday 21st. Medal (if you have got one) appears first thing in the morning, ours was a Silver Flora. Rest of the day devoted to answering questions on the society and why Venus fly traps 'pass on.'

Wednesday 22nd. The public. A lady in Surrey informs us she has a lawn full of *P. grandiflora!* Funds are raised by selling our guide and Venus fly trap cultivation leaflets (with seeds).

Thursday 23rd. The public.

Friday 24th. The last day. Protect stand from the public when plants are sold after 5 o'clock. Hire van to clear away plants, etc. Absolute chaos. By 8:30 p.m. van loaded and we are on our way. Home and bed about 1 a.m. It's been a long week but worth it. Thanks must go to:

1. All those who formed the committee for their time, transport and telephones.
2. The secretary's parents who helped make the pond and other parents and friends who did endless fetching and carrying.
3. Those members who helped set up the stand on Saturday and those who 'served time' during the week and those who helped tidy up on Friday. Plus, of course, you know who from Somerset for lending the plants to

Byblis gigantea

by Bill Pamment

Byblis gigantea is an Australian species confined to the South West corner of Western Australia and was first discovered by botanist and collector James Drummond.

Favouring poor, sandy type soils, it prefers moist rather than sodden conditions and should not be grown in a container of water during the growing period. The plant becomes dormant in early autumn and should be allowed to dry out completely during this time until early winter.

Its natural habitat being very dry during autumn, the plant begins new growth at the start of winter, with the coming of the winter rains. If repotting is necessary, it is therefore best carried out just before watering is commenced at the beginning of winter.

The latter half of autumn, about the first or second week in May, is the best time to plant the seed. Seed should be placed in a small screw-top glass container or plastic phial, boiling water poured over the seed, and the top screwed on. It remains in this water for 48 hours, during which time it should be given a gentle shake several times to drive the seed into the water. (This is necessary because the seed has an oily covering which makes it difficult to wet.) At the end of this time most of the seed will be on the bottom of the container: that which is still floating is not of much value and can be disposed of.

Seed quantity planted should be at least two to three times the number of plants required. Quite a few of the baby plants that do germinate die off because of lack of a good root system, and extreme care must be taken at this stage, as these baby plants are extremely fragile. If watering is necessary, soak the container until the surface of the mix is just damp—any excess water will wash the plants out of the mix.

Prepare a squat plastic pot of suitable size to accommodate the quantity of seed being planted, with a mix of two parts of fine, washed sand and on part of either German or Irish peat (both are quite good). Fill the pot to within 2cm of the top, and firm the mix down gently with a smooth, flat object. (I like to use a Kraft cheese glass with its lid, which is nice and flat, on top.) Soak the pot in a container of water deep enough to bring the water level to the top of the mix, allow to drain and then plant the seed.

As the seed will still be wet it must be planted one seed at a time using a sharpened match or tweezers. Take care to leave about 2cm between each seed so that when it comes time to transplant the seedlings, a small ball of mix can be taken

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finish the stand, and R. Cantley for supplying the *Nepenthes*.

Would those who offered help and did not turn up please think carefully before doing so next year? Because of ticket allocation some keen members were *very disappointed*. Alternative arrangements would have meant they could have attended.

Why do we do it?

After the hassle of setting up the stand we question our own sanity. We look back on it and it's a lot of fun even after spending a day on your feet answering questions about Venus fly traps.

The society owes its continuation to Chelsea. It 'tops up' the membership each year to a number that keeps us solvent.

We also sell approx. 400 Guides to C.P. plus other pamphlets, all of the money going to Society funds.

Without doubt interest in C.P. collecting is on the increase and exposure at this sort of event does nothing but good.

Reprinted from the newsletter of the British Carnivorous Plant Society, No. 2, 1985.

with each seedling, thus causing less root damage.

Having planted the seed, gently press the seed into the mix with the cheese glass lid (instead of covering the seed with the mix), place a sheet of clear glass over the top of the pot and place in a bright corner of the glasshouse. In approximately five weeks' time, two small leaves from each plant should appear. At this time the glass cover may be removed. During this five week period no watering should be necessary.

From the time the plants reach their leaf stage, it is reasonably safe to transplant them into a 15cm plastic pot, in the same mix as above. Place them in a bright position and water. If some coarse pebbles are placed on one side of the pot, on top of the mix, then the plant may be watered from above without disturbing the surface of the mix. Having watered the pot well, it should not be watered again until the top one centimetre of the mix is quite dry. Remember these plants grow in semi-arid conditions, not in a waterlily pond!

The big secret in both growing these plants, and in getting the seed started, is in the watering. "BE MEAN WITH IT," and if, as autumn approaches, the plants show any sign of going dormant (leaves going yellow and looking very scruffy), withdraw the water and let them dry out completely. If they do not go dormant, then just water as normal, as they require it. Growth will, however, slow down quite a lot.

My seedlings, grown under the above conditions, reached a height of 40cm in the first nine months and flowered from every leaf. Having seen this beautiful plant in bright light, with all its beautiful colours reflecting from the leaves, I can understand why it is called the Rainbow Plant.

Reprinted from the journal of the Victorian Carnivorous Plant Society, Vol. 2, No. 1, 1985.

Rearing Cobras

by Jennifer Brownfield

These highly prized and unique plants are a must in any C.P. enthusiast's collection. Their incredible bulbous heads and snake-like fangs on top of the twisted stems immediately capture a person's attention and interest. Needless to say, much time can be devoted to ensuring one's plants are in their best health, and due to their relative rarity and high cost, considerable concern is expended over whether what we are doing is best for the plant.

This is the first of a two-part article in which I tell of my methods and techniques for ensuring the proper care and conditions that should be provided for the plant. I initially discuss how to care for mature plants, their likes and dislikes, and complete the submission in the second part, writing about propagating from cuttings of both rhizomes and leaves, and finally about how to raise seeds. At this stage, I would like to make it known that some of the following are observations only and may not be botanically accurate; even though we at Al Carnivor have been raising cobra plants for around ten years now, we still have an occasional failure.

To continue - For the purpose of this explanation I will consider a mature plant to be over two years old, or a minimum of 7cm tall. This ensures that the early juvenile leaves have ceased forming and the following comments will apply.

For the perfectionist, a cobra should have 14 hours of cool, bright light, good air movement with humidity above normal, and its roots constantly washed by underground cold water seepage that has a temperature no warmer than 17°C. Fortunately, cobras are reasonably hardy and fairly forgiving, allowing us, with a few improvisations, to have reasonable success with these plants.

Definitely the first major requirement to consider is how to ensure a cool root system,

Darlingtonia californica.

Photo by Kim Lynch.

hence the tendency to terracotta pots and not black plastic and the like. Terracotta can be kept cooler by frequent wetting on the outside, duplicating a Coolgardie Safe action, or placing the plant's pot into a larger terracotta pot and filling the gap lightly with sphagnum moss which can be kept wet. I have found that the ambient temperature above ground is not a worry and it can rise to above 40°C for a short time without loss of the plant, so long as the relative humidity is kept high. Other ideas used during peak hot weather entail using ice cubes on the surface or refrigerated water, but I feel all that is really necessary is placing the plant down on the ground under a bench in fairly strong shade and thoroughly watering each day—but be aware that cobras dislike standing in stagnant water. It is better to err on the dry

side than to have the plant too wet, especially during winter, when the plant is dormant.

An inexpensive container suitable for cobras is the foam fruit container. Though it is not as good as terracotta, it has good depth for the growing medium. This is necessary as the plant's roots are very long and coarse. I have found the plant is not particularly sensitive to the growing medium and have used pure peat, peat and riversand 3:1, and sphagnum and river sand 3:1 successfully. Eventually the sphagnum has proven to be the best because it is cooler during summer with less fungal problems and a more even moisture content throughout the year.

Repotting appears to be required no more often than every third year, however a three year old plant may well be sending out "runners" by that age and repotting will be necessary to provide extra room in the pot. The runners mentioned are similar to couch-grass and travel underground from th parent plant for a distance of around 40cm, whereupon they surface and their ends rapidly establish new plants. The growth rate of one of these plants conservatively is 4 to 5 times faster than an individual plant.

The main growth period occurs from October to May, our normal spring to autumn span. Runners begin from around the new year on, flower spikes around late spring, and new leaf growth from early spring. The first leaves tend to be abnormally vigorous and a 3 year old plant around 10cm tall can suddenly grow a 30cm plus leaf, followed by two or three more slightly smaller leaves. The thickness of the base of the new leaf will indicate how tall the young leaf will become. The leaf grows to maximum height first then the head and fangs blow out to their full size.

This is the time to be particularly vigilant, for pests and grubs can cause havoc on the young tender new growth which unfortunately they seem to find particularly delectable. It only takes a micro hole on a developing new leaf to completely ruin it when it matures, for the hole grows with the leaf.

Cobras appear sensitive to many insecticdes and fungicides so use caution here. Half-strength trials are wise. New growth suffers first with the new leaf browning and going hard. Older leaves tend to lose colour and wilt over. Carbarul is a particularly nasty spray. Perhaps it's the lead component. Benlate fungicide may not kill the plant, but appears to be harmful to new growth. Natural sprays such as Pyrethrum and/or garlic appear to cause no ill effects. A fungus or brown rot can seriously afflict the main corm or rhizome, resulting in the leaves rotting from the base up. I suggest careful pruning and 2 or 3 weekly half-strength applications of a fungicide will help, but I am eager to hear further comments on this problem.

During winter there will not be any growth so reduce watering, perhaps to just once a week, and keep the plant barely moist. I have accidentally almost dried out plants without too much of a problem, but this cannot be allowed during the growing season.

Finally, the question of humidity. Certainly a high moisture content in the air is most suitable. The fangs and head of the leaf are particularly susceptible to dry air and dry out brown. Devise ways of best placing moist sphagnum around the plant. Standing the pot above the surface of a tray of water may be sufficient.

Reprinted from the journal of the Victorian Carnivorous Plant Society, Vol. 2, No. 2, 1985.

LET'S GET TO KNOW OUR MEMBERS

Several past issues of CPN included biographical sketches and pictures of our members, but due to lack of input these feature stories have not appeared lately. Don't be modest! Send us a paragraph (or more) about yourself and your interest in CP with a black and white photo or color slide. We'd like to get to know you!

Review of Recent Literature

Parkes, DM and ND Hallam. 1984. Adaptation for carnivory in the West Australian pitcher plant *Cephalotus follicularis* Labill. Aust. J. Bot. 32:595-604.

This is more or less a review of the morphological characteristics of the species indicating its carnivorous habit and supporting the concept. The review is then supplemented by original SEM and TEM of various cell types in the pitcher, and all has been correlated for a concept of the species evolutionary and taxonomic significance in its adaptation for carnivory. DES

Phillips, Harry R. 1985. Growing and propagating wildflowers. The University of North Carolina Press, Chapel Hill, 331 p. (PO Box 2288, Chapel Hill, NC 27514)

Harry Phillips is curator of native plants at the NC Botanical Garden in Chapel Hill and he has just authored the best book on growing and propagating native plants that I have ever seen. The book is divided into five parts, including cultivating native plants, propagating native plants, wild flowers, carnivorous plants and ferns along with several helpful appendices, glossary of botanical terms and illustrations. In the various plant sections, each species or genus is briefly described as to habit and habitat, and then the author goes into detailed and easy to read and understand growing and "propping" instructions which obviously bespeak a depth of knowledge and experience. You can rest assured that he has used each method successfully. Where he is dubious and where there are difficulties, he admits to these.

Of special interest to our readers, of course, is the CP section which covers all the eastern US genera. This section alone, along with the general introductory material, makes this a valuable reference to all of us, and of course to those of us with interest in ferns and wildflowers; the rest is a happy bonus. (Write publisher at address above for ordering information.) DES

Joel, D.M., Geptstein, S. Chloroplasts in the epidermis of *Sarracenia purpurea* ssp. *purpurea* (the American pitcher plant) and their possible role in carnivory: An immunocytochemical approach. Physiol. Plant 63(1): 71-75 1985.

Using light and electron microscopy, as well as fluorescent and immunohistochemical techniques, it was demonstrated that photophosphorylation and carbon dioxide fixation occurs in the bottom zone of this pitcher plant. The authors discuss the significance of this system to the aquatic organisms inhabiting the pitchers of this plant.

Sasago, A. and T. Sibaoka. 1985. Water extrusion in the trap bladders of *Utricularia vulgaris*. I. A possible pathway of water across the bladder wall. Bot. Mag. Tokyo 98:55-66.

Experimental techniques such as Sodium azide inhibition and encasing all of the bladder but that portion near the entrance with paraffin, indicates that water egress occurs via the bifid trichomes located near the entrance. Data includes observation of bladder shape changes and measurement of pressure changes. DES

N & V (from page 60)

the Venezuelan valley which looks prehistoric and where the *Heliamphora* are found. The plant did not appear to be the well known species in cultivation.

I have been experimenting on a way to prolong the life of *D. burmanni* 'Green'. During 1984-85, I grew many individuals which flowered and died. I decided to cut off a flower scape as soon as it was noticeable. The plant now is still thriving and all the others died more than four months ago. I will continue to cut all new scapes and will let you know how long it survives.

Sarracenia minor.
Drawing by Matthew Hochberg

WANT ADS

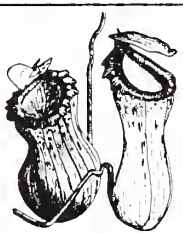
When submitting Want Ads, please be sure to print clearly for best results and to eliminate mistakes. Please circle the correct letter before each item (Want, Trade, Sell or Buy). Want ads are limited to carnivorous plants, terrariums, greenhouses and moss. There is a charge of ten cents per item, with no limit to the number of items you may submit per issue.

Send coin or check to:
Arboretum, Want Ads
California State University
Fullerton, CA 92634

David Holguin III (1807 Arnold Palmer Dr., El Paso, Texas 79935) (WB) Cuttings or seedlings of: *Nepenthes - rajah, villosa,* × *kinabaluensis,* and *lowii.*

Lee's Botanical Gardens (P.O. Box 7026, Ocala, Fla. 32672) regrets that due to problems all business transactions have stopped until we relocate in Miami and reopen for '86.

Paul Sprung (Rt. 1, Box 240. St. Francis, Maine 04774) (WTB) *Sarracenia flava* × *rubra,* compact forms of *Sarracenia leucophylla.*



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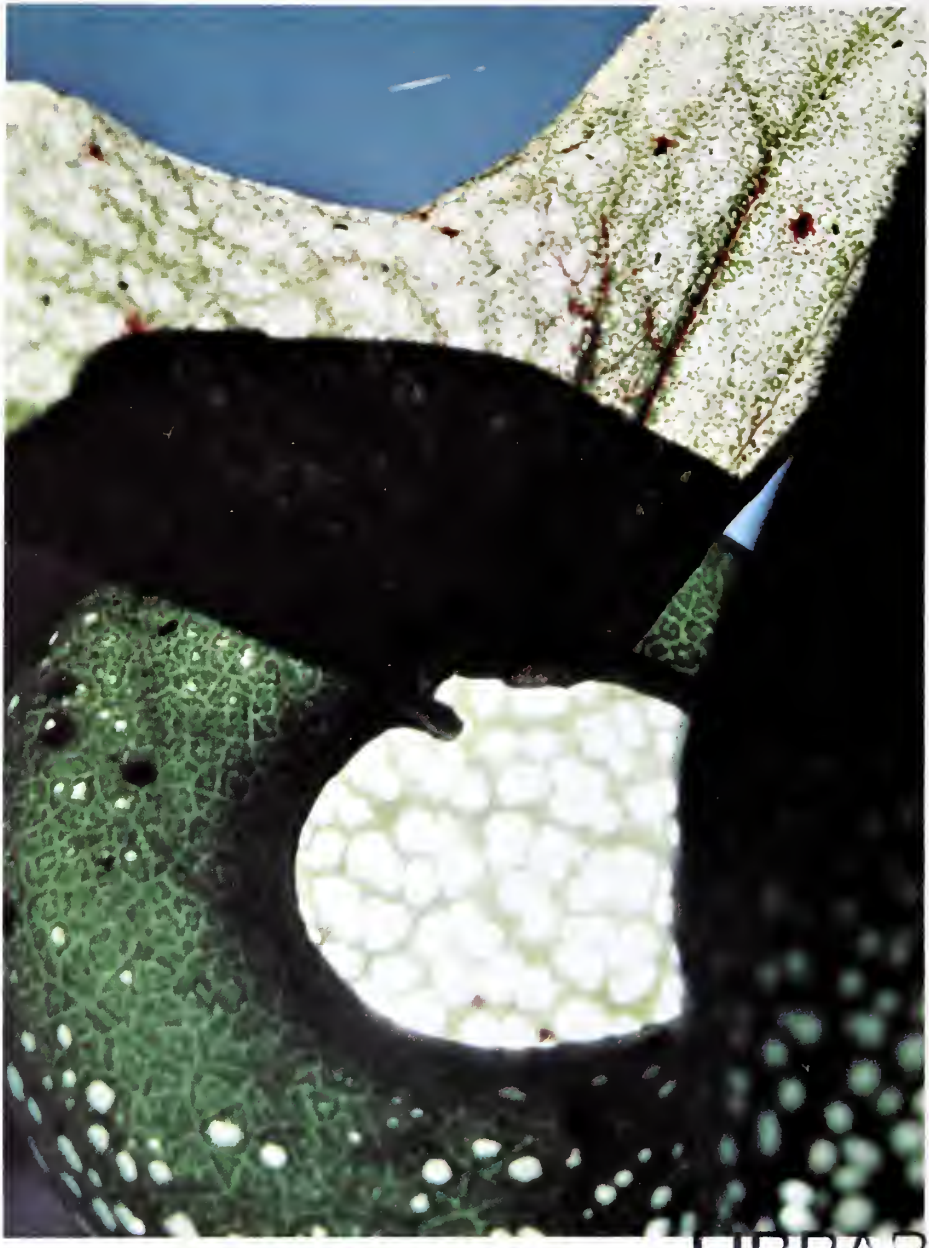

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Insect's eye view of pitcher of *Darlingtonia californica*. Note "windows" that fool insects into entering. Once inside, insects become confused and eventually fall to bottom. Photo by J.M. Mazrimas.